

Title: **LOS ALAMOS NATIONAL LABORATORY
SCIENCE EDUCATION PROGRAMS
PROGRESS REPORT**

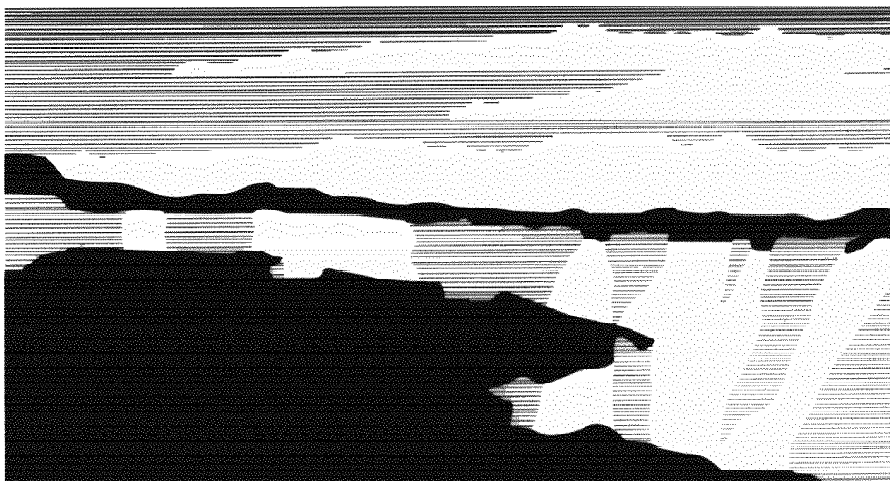
January 1 – March 31, 1996

Author(s):

Submitted to:

Los Alamos
NATIONAL LABORATORY

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the University of California for the U.S. Department of Energy under contract W-7405-ENG-36. By acceptance of this article, the publisher recognizes that the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. The Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; therefore, the Laboratory as an institution does not endorse the viewpoint of a publication or guarantee its technical correctness.



LOS ALAMOS NATIONAL LABORATORY

SCIENCE EDUCATION PROGRAMS

PROGRESS REPORT

January 1 – March 31, 1996

Los Alamos National Laboratory

Mail Stop F671

TABLE OF CONTENTS

TEACHER/FACULTY ENHANCEMENT	1	
National Teacher Enhancement Program (NTEP)		1
Nonproliferation & International Security – Teacher Enhancement Program (NIS – TEP)	1	
Teacher Environmental Assessment and Monitoring Program (TEAM)	2	
Teacher Research Associates (TRAC)	3	
Teacher Opportunities to Promote Science (TOPS)		3
TOPS Mentor/Weather Tracking Project	4	
Science Outreach Program	5	
CURRICULUM IMPROVEMENT	6	
Radiation/Risk Assessment Curriculum Development		6
Aims Curriculum Development	6	
Science at Home	7	
STUDENT SUPPORT	8	
Pre-Service Institute for Science and Math (PRISM)		8
Summer Experience for the Economically Disadvantaged (SEED)	8	
Summer of Applied Geophysical Experience (SAGE)		9
Pipeline Initiative	10	
Critical Issues Forum	10	
New Mexico Supercomputing Challenge	10	
Historically Black Colleges and Universities (HBCU)	12	
Mentored Collaborative Research With Resident University Teams	13	
Regional Science Bowl	14	
Underrepresented Minority/Female Initiative	14	
Atomic, Molecular, and Optical Physics Summer School (AMO)		15
Science Engineering Research Semester (SERS)	16	
Science and Technology Alliance	17	
Regional Two-Year College Initiative	17	
Faculty and Student Teams (FAST)	17	
EDUCATIONAL TECHNOLOGY	19	
Teaching Hearing-Impaired Students to Speak	19	
Education Networking Support (EduNets)	20	
Distance Learning and Educational Technology	24	
Systems Modeling for Education	25	
GEONet/TOPS Electronic Bulletin Board	25	
Model-Nets: A National Study of Viable Models of Networking Technology in K-12 Education	26	
Hypermedia Compact Disc/Fast Tool Servomechanism (FTS)		26
PUBLIC UNDERSTANDING OF SCIENCE	31	
Practical Applications for Young Scientists (PAYS)		31
Science Education Information On-line	32	
OTHER	33	

LOS ALAMOS NATIONAL LABORATORY

SCIENCE EDUCATION PROGRAMS

PROGRESS REPORT

January 1 – March 31, 1996

TEACHER/FACULTY ENHANCEMENT

National Teacher Enhancement Program (NTEP)

The emphasis for the third year includes a leadership component along with curriculum development. A scenario was developed to bring the first two years together and to demonstrate how to incorporate leadership into the program. The plan is to build toward the development of a transfer component consisting of a curriculum piece, an action plan, and a leadership product (these may be all one product). Teachers were asked to identify three areas of science where needs for growth were the strongest as identified by their surveys (developed last quarter). Areas for self-immersion were determined and encompass the science fields of energy, geology, and life science. The February workshop emphasized leadership for change and was led by RoseAnn McKernon, a Southwest Education Development Laboratory (SEDL) facilitator.

The summer session has been scheduled for three weeks (June 3-7, June 24-28, July 1-3). A fourth workshop will be held in April to make up for the shortened summer schedule and will cover the Event Based Science Curriculum model. The teachers will be asked to begin the development of their immersion projects based on this model and will include a leadership component.

A follow-up grant will be awarded to the participating teams to allow them the opportunity to incorporate their developed curriculum projects into the fall semester. As part of the follow-up grant, visitations will be made to evaluate the effectiveness of the curriculum and leadership roles assumed by the teachers. Parameters for the follow-up grants are under development.

Nonproliferation & International Security – Teacher Enhancement Program (NIS – TEP)

DOE's Nonproliferation and National Security Office of Research & Development (NN-20) hosted the FY95 Program Review for the 1995 Summer Research Internship Program in Washington, D.C. on March 4-5, 1996. Presenting on behalf of LANL's 1995 Teacher Enhancement Program were Carol Mooney, the Science Education and Outreach Group's NIS-TEP Program Coordinator; Paul Argo, NIS-TEP mentor at

NIS-1; and Anita Gerlach, an NIS teacher researcher from Santa Fe High School.

Plans for the 1996 NIS-Teacher Enhancement Program are underway. The Science Education and Outreach Group received six research proposals from NIS scientists for the 1996 summer session. In addition, a combined total of thirty-seven teachers from New Mexico, Arizona, Colorado, and Texas submitted applications by the March 4 deadline for both NIS-TEP and the parallel Teacher Research Associates (TRAC) program. TRAC applications were included in the NIS-TEP applicant pool this year to increase the number of candidates from which mentors could choose.

Mentors reviewed teacher applications from mid- to late-March; most mentors were sent a minimum of three applications, and some received as many as six. The majority of the mentors selected their candidates by the end of March. Acceptance letters were then mailed by the Science Education and Outreach Group to the selected teacher applicants asking them to accept or decline their positions in writing by April 15, 1996. Approximately six teacher researchers will participate in NIS-TEP and ten will participate in TRAC this summer.

Teacher Environmental Assessment and Monitoring Program (TEAM)

Noteworthy events/accomplishments for the TEAM program in the second quarter of FY '96:

The 1995-1996 cadre's second follow-up workshop was held in Los Alamos, February 5-6, 1996. Below are some of the highlights of the workshop.

- Sessions on the presentation: Andy Adams (written presentation), Daniel Valdez (oral presentation), and David Bones (visual/poster sessions) of scientific results, in preparation for the May 6 Student Research Summit;
- A visit to the Los Alamos County Waste water Treatment Plant (which flows, one way or another, into the canyon where the group did their sampling during the last workshop);
- A session by Pat Longmire of the CST-7 group on data analysis. Pat delivered a presentation reviewing the characteristics of the canyon and on analyzing the data we collected at the last workshop. He introduced us to a computer data analysis software (PHREEQ) which we used to help answer some of the questions on his latest problem set;
- A visit in the field with three scientists/technicians from the surface water quality group. The group visited three different monitoring sites—one being in Los Alamos Canyon, where we have now seen how scientists

collect data regarding the ground water (Pat and Andy) and the surface water—and their mobile and permanent laboratory; and

- Sharing of miscellaneous program implementation information by program participants.

School site visits. The program coordinator made visits to all schools in El Paso and Juarez during the month of April. The purpose of the visit was to:

- Double-check GEONet connections/accounts;
- Review--individually--program progress and program portfolios;
- Discuss the May 6 Student Research Summit (and meet with any student teams formed who might have questions about the Summit); and
- Talk about the 1996 TEAM Program summer institute.

TEAM program summer institute planning, recruitment, and selection. Two summer institute planning sessions were held during the second quarter with Andy Adams and the three “Master Teachers.”

Teacher Research Associates (TRAC)

The DOE will fund ten teachers to participate in Los Alamos National Laboratory's 1996 regional TRAC program, which places teachers in research positions from June 17 to August 9 under the supervision of Laboratory scientists. Also during those eight weeks, DOE's Nonproliferation and National Security Office of Research & Development (NN-20) will fund six teachers to conduct research with the Nonproliferation and International Security Division through the Teacher Enhancement Program (NIS-TEP).

The Science Education and Outreach Group (SEO) mailed recruitment packets to schools across New Mexico in January, 1996. SEO also decided to accept regional teacher applications from Arizona, Texas, and Colorado after learning that the national TRAC program was not funded for FY96. SEO received, by the March 4 deadline, a combined total of 37 teacher applications to both the TRAC and NIS-TEP programs.

Concurrent with soliciting teacher applications, SEO sent out a request-for-proposals to scientists across Laboratory divisions and programs. Ten research proposals for TRAC and six for NIS-TEP were selected for funding. The scientists, who will serve as mentors to the teacher participants, reviewed teacher applications from mid- to late-March. Most mentors were sent a minimum of three applications, and some received as many as six from which to select a teacher researcher. Acceptance letters were then mailed by the Science Education and Outreach Group to the selected teacher applicants asking them to accept or decline their positions in writing by April 15, 1996.

Teacher Opportunities to Promote Science (TOPS)

During the first quarter of FY96 Los Alamos accomplished the following in the TOPS program:

Completed the second round of site visits for the third TOPS cohort. The coordinator observed science, math, or technology classes for demonstrated classroom applications of methodology, strategies, content, technology, etc., introduced to the teachers during the TOPS workshops and summer institute. Visits included school administrators, teams, and teacher peers.

Conducted six New Mexico regional meetings for LANL and SNL TOPS teachers, mentors, and alumni. The meetings were designed to provide technological support for the storm tracking project; increase teacher involvement on GEONet; and provide an opportunity to share and solicit feedback about the implementation of the instructional units designed during the summer institute experiences. During these regional meetings the requirements for the Lodestar cloud cover project were reviewed and guidelines for participation were developed. Cloud cover data collection will be piloted by TOPS teachers and students during spring of FY96.

Assessing the Impact of the TOPS Program on Participants' Students

The goal of this project is to document the impact of the first year of the TOPS program on participants students using assessment measures developed in previous years of the project. During the last quarter, we:

- completed scoring the select-and-fill-in concept map achievement response sheets;
- completed scanning all of the pre-test data into computerized form;
- started to analyze these data;
- started to develop a strategy to examine changes in scores across the school year;
- developed a tentative schedule for year-end data collection; and
- are about to begin to contact the TOPS teachers to finalize this schedule.

TOPS Mentor/Weather Tracking Project

During the first quarter of FY96 Los Alamos accomplished the following in the TOPS Mentor Program.

Completed the first round of site visits for TOPS mentors. The TOPS coordinator and science coordinator made site visits to the schools of the

TOPS mentors in the northern part of the state in conjunction with site visits to the third cohort of TOPS teachers. The purpose of the visits was to survey hardware needs and provide technical support for the storm tracking project.

Conducted a TOPS mentor workshop on February 2-3, 1996 in Albuquerque. The mentors planned the agenda, dates, and locations for the TOPS regional meetings. They revised the storm tracking manual and developed guidelines for the cloud cover data collection to be introduced to the teachers at the regional meetings.

Conducted New Mexico regional meetings for TOPS teachers and alumni. The mentors coordinated their respective regional meetings. They reviewed GEONet procedures and demonstrated the down-loading of weather data to the weather link and up-loading the data to GEONet. The mentors introduced the teachers to the new storm tracking manual and cloud cover forms; set up computer weather stations and facilitated hands-on practice for TOPS teachers and alumni participating in the storm tracking project.

Science Outreach Program

The Regional Educational Technology Assistance (RETA) initiative, funded by the New Mexico State Department of Education, is a new regional initiative that helped Science Outreach teachers develop their leadership skills and work within their districts, as well as with a partner district. Science Outreach teachers joined approximately 30 other educators statewide to form a RETA cadre of technology advisors. Using the Science Outreach program, a teacher enhancement program designed to support state-wide educational reform, the RETA cadre benefits from a current educational technology framework that has developed to provide the technical assistance and training now proposed for Technology Leaders. This alliance not only strengthens the resource base available but will also facilitate administrative requirements.

The Science Outreach core and RETA participants attended a workshop in Las Cruces, New Mexico, at New Mexico State University, on Friday, April 12, 1996, and focused on assessment strategies. As the culmination for this year's pilot effort, the RETA cadre was extremely successful in designing and running educational technology workshops called RETA Fiestas. The workshops brought over 600 teachers and administrators together from districts throughout New Mexico. Participants learned about educational technology resources and applications and forged new partnerships with each other and with regional higher education institutions.

The RETA Fiestas were held in March and April throughout the state at the following institutions:

Gallup (University of New Mexico Branch)	March 2, 1996
Portales (Eastern New Mexico University)	March 9, 1996
Santa Fe (Santa Fe Community College)	March 16, 1996
Cimarron (Cimarron Middle school)	March 23, 1996
Farmington (San Juan Community College)	March 30, 1996
Las Cruces (New Mexico State University)	April 13, 1996

CURRICULUM

Radiation/Risk Assessment Curriculum Development

Work on the radiation curriculum continued with the receipt of a color draft of the materials and a meeting with Santa Fe public schools to review the program and the curriculum itself. Dr. Yvonne Gonzales, Superintendent of Santa Fe Public Schools, was very pleased with the joint project and spoke highly of all personnel involved. More significant was the endorsement by Pat Weaver, SFPS Director of Curriculum who was first exposed to the project. Subsequent to the meeting it was announced that Dr. Gonzales is relocating to be the superintendent of the Dallas schools and that Dr. Weaver is the acting SFPS superintendent.

Significant effort was placed on developing additional funding for the curriculum and for the educational component of the NEWNet program. If the curriculum is to be widely distributed in the fall, more funds are required for publication and coordination of the distribution scheme. Further, development of a curriculum diagnostic for evaluation of effectiveness needs to be pursued. On the positive side, the most recent issue of LA Science is quite complimentary to the radiation curriculum and would be a good candidate for distribution with the curriculum. However, funding difficulties with LA Science suggest that additional funds would be required to support the wide distribution suggested.

Finally, while visiting the International Distance Learning Conference (IDLCON), contact was made with MBS Textbook Exchange, Inc. This company is in the business of distributing textbooks for distance learning courses so that students do not have to leave home to go to a particular bookstore. In preliminary discussions, the MBS representative indicated that the company pays for the rights to distribute books and that they might be a good vehicle for distributing materials such as the radiation curriculum and other Lab science education products. In this way publishing and distribution costs can be recouped without the Lab having to enter into the mail order business.

AIMS Curriculum Development

Classroom Lessons on Unstable Fluid Interfaces

We continued writing classroom lessons collaboratively with AIMS Educational Foundation (Fresno, CA) for the first-ever textbook on Rayleigh-Taylor instability, intended for grades 5-9. Lessons on surface tension effects ("Soap Spills") and flow patterns ("Flow Fingers") are nearly complete, and are expected to be published in fall 1996 issues of the AIMS newsletter, having a circulation over 12,000. We also started documenting lessons on failure analysis ("Oopsy-do"), bottle engineering, and "Rayleigh-Taylor Olympics."

Also, we proposed a full-length article on Rayleigh-Taylor instability to the editor of "The Physics Teacher" magazine, primarily for high school, junior college, and college teachers. The editor agreed to the proposal, and the manuscript is about 20% complete.

Science at Home

Interest continues to remain high in the Science at Home activity book. There have been approximately twenty requests for the book since January 1996. There is also interest in the training we provide to conduct Science at Home programs in schools and communities. We continue to provide modified training sessions and promotional presentations around the state of New Mexico, upon request. Interest in the book is coming from such audiences as the Home School community, in addition to the public schools. DOE Nevada has requested both the book and information about the training to use in its education outreach program. The U.S. Ambassador to Mexico has requested a copy of the book and is interested in having teachers and parents in Mexico use Science at Home during the country's "Science Month" activities. Curriculum Associates, Inc., the publisher of the book is completing the final draft which is expected to be released on the commercial market in the fall.

STUDENT SUPPORT

Pre-Service Institute for Science and Math (PRISM)

The student-directed research course developed by the science education specialist for the PRISM program students is being implemented this semester at UNMLA by Jim Amann (Subatomic Physics Group). The students have chosen the following research question. Do cheap sunglasses protect your eyes from UV radiation any (better/worse/no difference) than expensive sunglasses? The students have researched some of the current popular and scientific literature, been presented facts about electromagnetic radiation in general and ultraviolet radiation in particular, and developed an experimental procedure to test the research question. They begin data collection on April 19.

The six-week summer institute begins June 3, meeting four days per week. The PRISM participants will form teams to conduct astronomy related projects at LANL, enroll in the introductory astronomy class at UNMLA, attend skill-building and leadership seminars, and present project results to their peers. The participants will work directly with technical groups to implement the following projects:

- install a CCD telescope at Fenton Hill (MILAGRO),
- track and analyze satellite motion (ALEXIS),
- build an astronomical detector (radio telescope-AOT), and
- analyze astronomical images and create models from data (CIC-19).

Summer Experience for the Economically Disadvantaged (SEED)

During the second quarter of FY96, LANL solicited work proposals from Laboratory scientists for summer research experiences for Project SEED students. A total of 12 proposals were received for this program. We submitted these project proposals to the American Chemical Society (ACS) for funding. There were 4 requests for SEED II students, and 8 requests for SEED I students. As was done last year, LANL agreed to split fund with ACS the 1996 student positions.

To stimulate student applications and emphasize minority recruitment, the program coordinator visited schools in northern New Mexico to deliver applications as well as inform students, counselors, principals and teachers of this program. Also, applications were mailed to counselors and principals at schools in the target area, and to Native American contacts. LANL handed out additional program information at the American Indian Student Career Conference at St. Catherine's Indian School on March 26, 1996. Barbara Grimes of LANL's Community-

Involvement and Outreach Office also distributed program applications to various Native American schools throughout the target area.

The program coordinator met with UNM-LA to coordinate the summer class for Project SEED students, which will run for eight weeks in the summer. A \$1600.00 grant from the local chapter of the American Chemical Society (ACS) was petitioned in order to take 4 students from the 1996 SEED cohort to the ACS National Convention in Orlando, Florida in the Fall of 1996.

Project SEED will begin on June 17, 1996 and run through August 9, 1996.

Summer of Applied Geophysical Experience (SAGE)

SAGE, a "hands-on" undergraduate- and graduate-level geophysics field course, is preparing for its 14th summer of operation. In March, the SAGE faculty met in Los Alamos for a semi-annual planning workshop. Foremost on the agenda was planning the SAGE 1996 field program, which will be the most ambitious undertaken by SAGE. As for the last two years, the Colorado School of Mines will provide, on a cost-shared basis, a Vibroseis seismic survey. In addition to a basin-scale geophysical investigation to complement the previous years' work, SAGE 1996 will also undertake geophysical surveys of an environmental site at Los Alamos using a variety of geophysical techniques. A similar project, undertaken last year, was evaluated very highly by the students, many of whom will probably find jobs in the field of environmental geophysics. This small-scale "applied" project will also benefit the Environmental Project at Los Alamos inasmuch as it will constitute a feasibility study for possible additional geophysical work.

Preparations for SAGE 1996 included mailing of almost 1000 information packets and application forms to colleges and universities across the U.S. and some foreign institutions, and almost daily contact by e-mail and telephone with potential students. Completed applications are in the process of arriving prior to the April 15 deadline. We anticipate accepting 30 students, who will span a range of backgrounds and educational levels, to SAGE 1996.

In addition to looking forward to SAGE 1996, we continued with activities from the previous year. In January a workshop for selected REU-undergraduate students who attended SAGE 1995 was held at the University of Texas in El Paso. REU-undergraduates are students who were undergraduates, or who were recent graduates but not yet enrolled in graduate school, during SAGE 1995 and whose support was augmented by the Research Experiences for Undergraduates (REU) program of the National Science Foundation. The purpose of the workshop was to allow the students additional opportunity to process and interpret seismic data which they themselves had helped to collect during SAGE 1995. Some of the students, who had chosen to focus on other geophysical techniques during SAGE 1995, had not had much experience

with seismic processing; for others, the workshop allowed time for them to develop their skills with seismic processing. From past experience, the SAGE faculty has found the workshop format to be very successful in allowing students to continue their experience, augmenting their processing and interpretive skills. SAGE is grateful to the Department of Geological Sciences of the University of Texas at El Paso for hosting this workshop, including providing access to the necessary hardware and software, at no cost to SAGE.

Finally, in this quarter a research paper was submitted to the New Mexico Geological Society for publication in its 1996 Annual Field Conference Guidebook. Three former SAGE students, who developed Senior and Masters theses from the data, are included among its authors.

Pipeline Initiative

Staff of the Science Education and Outreach Group are working with science education and special employment program providers across the Laboratory and at other institutions, such as Intel, to develop a Pipeline Initiative. The initiative, to be piloted with a small cohort of students during the summer of 1996, will ensure that promising student participants in the Laboratory's science education and special employment programs continue to participate in progressively more challenging educational opportunities in science, math, engineering, or technology. Students selected to take part in the initiative will progress through a "pipeline" of programs that enhance learning and/or provide work experience in science-related fields.

Critical Issues Forum

A two-day introductory workshop was held at LANL on January 18 - 19, 1996 for the participating teachers. Computer hardware and software issues were covered on the first day, along with the workings of the GEONet. The second day featured a session on Socratic Questioning, and a presentation by Jim Tape and Joe Pilat of the Nonproliferation and International Security division. On both days, mentors joined the teachers for a working lunch, to begin the dialogue that will continue on-line.

A second workshop was held at LANL on February 20, 1996, for the participating teachers. The focus of the workshop was on the scientific and social arenas. Jerry Beery of ESH-13 delivered a presentation on the science of nuclear materials disposition, followed by an active question and answer session. Garry Franklin of the Bradbury Science Museum presented the social aspects in a tour and follow up discussion at the Museum. Teachers were also involved in training in the use of Powerpoint Presentation software, and participated in further GEONet training.

Site visits were begun to participating schools, to check on the progress of the teams and their research. In March, the following high schools were visited: Ruidoso, Alamogordo, Santa Teresa, Gadsden, Las Cruces, Los Lunas, Highland and Bernalillo. At each site, the program coordinators

met with participating students, teacher(s) and an administrator in order to help teams to identify the focus of their research and to offer suggestions for shaping critical thinking and problem solving skills.

New Mexico Supercomputing Challenge

The Challenge five-year report has been finished and 1000 copies made that will be distributed to contributors, sponsors, funding agencies, participant teachers, and others who would be interested in learning about the Challenge. It has been assigned the number LA-13091-PR.

The five-year report was reduced from 20 pages to 10 and submitted to the Taos Community Networking Conference that will be held in Taos, New Mexico in May. It was accepted to be published in the conference proceedings.

As a result of the Challenge display at Super Computing '95, we have been contacted by Jim Muldavin of Capital Focus in Sacramento, California to participate in a Supercomputing workshop at Cal Tech in March 1996. The workshop was aimed at minority youth and drew about 125 high school students drawn from math, science, and computer magnet schools in Los Angeles County. David Kratzer and Agbeli Ameko (a former Challenge winner) attended the two-day event to advertise the Challenge and Los Alamos National Laboratory's influence on and use of supercomputers.

In January, four LANL employees traveled to Portales, Las Cruces, Socorro, Albuquerque, Farmington, and Las Vegas to present the one-day regional training sessions for Challenge participants. Representatives from Cray Research and New Mexico Technet attended as well. The events were held at colleges and universities which gave them an opportunity to promote themselves to the high school students, some of whom had never been on a college campus. The sessions included lectures, questions and answers, programming competition, and public speaking. One team from each region was selected as the "hot shot" team for their participation that day. They received awards from the local institution and will receive recognition at the Awards Ceremony in April.

In preparation for the two Summer Teacher Training Sessions (STTS), we met with representatives of Eastern New Mexico University (Portales) and New Mexico State University (Las Cruces) while we were there to make arrangements for this summer.

We made an effort to involve the Northwestern New Mexico community in the STTS by giving Fred Begay 50 applications to this summer's Challenge Teacher Training Session for him to give to Navajo high school teachers.

We currently have 46 applicants for the STTS. We have decided to make C++ the programming language taught in both sessions. (We had originally planned to have one session teach Fortran-90 and the other

teach C++, but the demand for C++ was greater and the Fortran-90 expert was not made available to us.)

The Challenge, along with Science Education Outreach (SEO), is participating in a teacher training program sponsored by U S West. A consortium from around the state is working together to spend about 500K improving K12 teachers' use and understanding of technology. Our aim is to involve Challenge teachers and reap new Challenge teachers from the participants.

Of the 204 teams beginning the Challenge, 134 turned in Interim reports in January. That percentage is up slightly from last year.

We promoted the Challenge by giving a talk to the Women In Science (WIS) sponsored "Expanding Your Horizons" high school day for girls. They were encouraged to participate in next year's Challenge.

The Challenge's other major sponsor, New Mexico Technet, cannot continue funding the Challenge at the current levels, so we have been working with them on possibilities that will reduce their cost without increasing ours. We have decided to change two rules for next year and possibly change others in the future. Beginning with the 1996-97 Challenge, schools will only be allowed to enter four teams. If the school has an enrollment of more than 1000, they will be allowed another team for each 500 students above 1000. The second rule change will be to require attendance at the Kickoff Workshop by first year participants and make it optional to those who have participated before. These changes will reduce the number of students beginning the Challenge, but should increase the retention rate of the Challenge. Each of the six years of the Challenge has seen an increase in enrollment.

We have been in contact with Don Holznagel, program director for the Northwest Educational Technology Consortium based at the Northwest Regional Educational Laboratory (NWREL) in Portland, Oregon, and with Roxy Maurant from the Alaska Staff Development Network Academy (State Department of Education) to introduce the concept of the Challenge to other states. We have been asked to attend two meetings. One is in Couer D'Alene, Idaho, to discuss the coordinations of the Challenge and how to get the program started in the Northwest Region (Oregon, Washington, Idaho, Montana, Wyoming, and Alaska). This meeting is with the technology coordinators from each of the states. In attendance at the second meeting will be State Department of Education representatives from the six states, university faculty from the six states, and other staff from NWREL. The purpose of this meeting is to thoroughly discuss the Challenge curriculum design, program development, and operation.

Roxy Maurant has invited us to Anchorage, Alaska, in June to an Alaska Staff Development Network Academy where over 1000 teachers will be training, since they do not have "in service" days in Alaska. For the Academy, we have been asked to give presentations on technology in education and to present the Challenge to teachers in a poster session.

Preparations are being made for the Awards Day activities to be held in April. About 300 participants are expected to attend.

Historically Black Colleges and Universities (HBCU)

During this quarter, the HBCU Program Coordinator:

- Attended the Mexican American Engineers and Scientists (MASE) conference in Orlando, FL, for recruitment purposes on January 9-10, 1996.
- Attended the National Association of Minority Engineering Program Administrators (NAMEPA), in San Francisco, CA, on January 26-30, 1996.
- Attended the National Conference of Black Physics Students (NCBPS'96), in Nashville, TN. for recruitment purposes , on February 15 to 18, 1996. He talked with the leadership of this organization about the possibility of LANL hosting one of their meetings in the future.
- Met with Ms. Bobbie Williams, Sandia National Laboratory (SNL), on March 1, 1996, to discuss LANL/SNL program development (fund raising) efforts.
- Attended the National Society of Black Engineers (NSBE) Conference, for recruitment purposes. Sandra Landry, from Staffing Office also participated, in Nashville, TN, on March 27-30, 1996.
- Kept track of and mentored the 13 HBCU students currently on-board during the academic year.

Mentored Collaborative Research With Resident University Teams

Microstructure And Properties Of Erbium Oxide (Er_2O_3)

Educational Objective:

Students of different educational levels will be working together under the direction of a senior laboratory scientist in a laboratory research environment. The targeted project area has technical relevance to DOE's Defense Programs mission. Embodied in this objective is the diversity and the recruitment of superior students from regional schools and universities. It is intended that the team approach of students with differing levels of educational experience will assist in providing a unique educational experience. At this time we are targeting Undergraduate Students, (UGS) and Graduate Research Associate (GRA, have completed four year science or engineering degree) students with intentions to encourage these students to pursue advanced degrees in science.

Technical Objective:

To more fully characterize Erbium Oxide (Erbia) which is an important ceramic material to the stockpile stewardship program and currently applied for its unique characteristics to contain molten plutonium. The microstructures and properties of both polycrystalline and single crystal erbia have not been extensively investigated. The project team proposes to fabricate both polycrystalline and single crystal erbia and study the microstructures, mechanical properties, and the thermal properties of this material. The proposed project will be conducted in association with the LANL Single Crystal Growth Laboratory (SCGL) at the Materials Science Laboratory (MSL).

The students will work under the supervision of Dr. John J. Petrovic and other LANL personnel associated with the MSL and the SCGL. The student activities will include a comprehensive literature survey on erbia; the fabrication of dense polycrystalline erbia materials from erbia powders; the synthesis of erbia single crystals from polycrystalline erbia feed materials; the microstructure characterization of erbia materials by techniques such as optical microscopy, scanning electron microscopy, x-ray diffraction, and transmission electron microscopy; and the mechanical property characterization of erbia materials using microhardness indentation methods as a function of temperature.

Second Quarter Progress;

A criteria for student selection and a recruitment process has been completed for this project. Currently, official employment offers have been extended to four selected students. The four students are:

Russell Romero, graduating senior at Los Alamos High School:
UGS

Marlene Platero, sophomore in Materials at MIT, from the Taos Pueblo: GRA

Robert Rodriguez, graduating senior in Materials at New Mexico Tech: GRA

Angelique Neuman, graduate student in Materials at New Mexico Tech: GRA

All students have accepted their offers and will be coming to LANL in late-May to begin their projects. The student team will be working directly under the supervision of Dr. John Petrovic, a Laboratory Fellow and be located in LANL's Material Science Laboratory, a new, fully-open laboratory equipped with state-of-the-art materials research scientific equipment. Although erbia is an important defense related material the research is unclassified and there are no special handling requirements. An initial literature survey on erbia has been initiated to assist in the research plans for the students.

Regional Science Bowl

During the 2nd quarter of FY96, the New Mexico Regional Science Bowl was planned and run in conjunction with Sandia National Laboratories. To help prepare for the event, four training sessions were held at Canyon School for all volunteers to go over the format, rules and procedures of the competition. LANL designed and produced the event program, and designed and printed 240 T-shirts. The T-shirts were distributed to all competitors, staff and volunteers on the day of the event. The remaining tasks, including facility set-up, training information, packet preparation and distribution, and team registration were done cooperatively with Sandia National Laboratories.

The event was held at the Hyatt Regency Albuquerque on February 26, 1996 from 8 AM - 5 PM with 15 teams competing in the Los Alamos National Laboratory sponsored event. Sandia National Laboratories held their competition with 16 teams at the same time as LANL. The winning team in the LANL bracket was Highland High School, which will represent New Mexico at the National Science Bowl to be held in Washington, D.C. on May 3 - May 6, 1996. After the competition, the awards banquet was held at the Hyatt Regency Albuquerque from 6:00 PM to 8:00 PM. Keynote speaker was Dr. Samuel Billison, one of the last of the Navajo Code Talkers from WWII.

Following the competitions, a debriefing session for all competition staff and volunteers was done over E-Mail in order to identify the strengths and weaknesses of the 1996 competition. LANL began planning for the trip to Nationals for the Highland High School team, and practice sessions were arranged for both the LANL and Sandia teams representing New Mexico.

Underrepresented Minority/Female Initiative

Currently there are 7 GRA students on board. Six of the seven are on a 50/50 salary cost share basis with their host technical organization and the URM/F program.

Plans are underway with UNM-LA to develop this summer's eight-week summer institute. About 20 students are expected to participate.

The Program Coordinator recruited at three minority conferences for summer internships: Mexican American Engineering Society (MAES), the Society of Hispanic Professional Engineers (SHPE) and the American Indian Science & Engineering Society (AISES).

Other Activities

- Supported LANL Native Americans in several recruiting and conference initiatives. They have submitted names and employment application needed for possible summer internships placements.
- Presented a co-authored paper at the American Society for Engineering Education Conference (ASEE) on the Advanced

Manufacturing Technology Program as it pertains to the Two-year College Initiative.

- Coordinated LANL participation at an all DOE national laboratories workshop held at the University of Puerto Rico Mayaguez campus with regard to potential research collaborations with Hispanic Serving Institutions (HSI) that have graduate level research capabilities.
- Have been working with LANL's Environmental Management Office in trying to put a program together that would support student/faculty teams working with the Field Teams on environmental clean up projects.
- Participated in the Four States NSF Rural Systemic Initiative (RSI) Steering Committee planning initiative.

Atomic, Molecular, and Optical Physics Summer School

This quarter marks the prime recruiting effort for the Los Alamos Summer School in Atomic, Molecular, and Optical Physics. This year, in addition to our usual distribution system of fliers to all members of the American Physical Society Division of AMO Physics and posters to all US physics and chemistry departments, we employed a World Wide Web home page at the University of New Mexico. This greatly increased exposure as well as permitting on-line applications.

We had over fifty completed applications with a wide geographical and educational spread. Our initial selection of sixteen students contained over 40% women, the largest in our history. The initial selection included 14 undergraduate and two first-year graduate students. This shift from past distributions with nearly equal graduate and undergraduate participation corresponds to a similar trend in the NSF-REU sites, designed to reach principally current undergraduates. We are now in the final acceptance process that should be complete by mid-April.

This phase also marks our development of programs involving mentors and lecturers. So far six mentors have volunteered their services to guide the students through a diverse set of projects, both theoretical and experimental. The process of choosing lecturers has just begun. Several prominent outside lecturers have already been scheduled, including Profs. Barbara Whitten (Colorado College), Ravi Rau (LSU), and Lyla Fabrikant (Nebraska).

Since one aspect of the School has always focused on supercomputing, we have moved this year to increase our instruction in massively parallel systems. We hope to use the IBM cluster at LANL for this purpose.

With such a diverse base of scientists and students, surprises become not unusual occurrences. Donald Cowart, a student mentored by George Csanak of T-4, continued his summer project during the school year. The results proved of considerable interest and caught the attention of Prof. Sergei Kazantsev of St. Petersburg State University, a world leader in

plasma polarization spectroscopy. Donald's computations may aid with interpretations of their experiments.

The School now moves into its most intense quarter of actual classes at the University of New Mexico in Los Alamos.

Science Engineering Research Semester (SERS)

On January 16, 1996, twenty-four college undergraduates from across the nation arrived in Los Alamos to begin their semester of scientific research. Due to unforeseen circumstances early in the semester, two of the SERS participants had to drop-out of the program. We currently have twenty-two participants. Students are working in the following divisions: Chemical Science & Technology, Computer Information & Communications, Engineering Science & Applications, Life Sciences, Theoretical, Material Science & Technology, Earth and Environmental Science, Accelerator Operations and Technology, and Physics.

There are many supplementary educational activities for the students this semester. The tours included local museums, the Jemez Mountains, the MILAGRO Gamma Ray Observatory, the earth science analytical and rock thin sectioning laboratory, and the Trinity Site at White Sands Missile Range. The guest speakers this quarter have included George Voelz (ESH-3), Ed Fenimore (NIS-2), Dave Vieira (CST-11), and Jim Freyer, Jim Jett, and Michael Alther of the Life Sciences Division. The SERS students hosted a potluck for the mentors on February 28, which was well attended.

The coordinator conducted site visits as part of the overall evaluation plan for SERS and these were completed in mid-March. The individual visits are approximately 1 hour in length and include both the mentor and the student. The site visits provide an opportunity for the coordinator to observe the student at work as well as discuss any issues related to the program. From these visits we can assess how the students and mentors are doing in their research situation and provide any necessary assistance.

At this point in the semester, the students are beginning to think about the upcoming poster session in May. Students have received special instruction on how to prepare and display an effective poster session and how to effectively deliver a technical presentation.

In addition, about fourteen of the twenty-two SERS students will be staying on for the 1996 summer as UGS or GRA student researchers. The fall 1996 SERS applications arrived April 8 and have been matched with twenty-five research proposals. The selections are currently being made by mentors.

Science and Technology Alliance

The Science and Technology Alliance Program Coordinator attended the New Mexico Highlands University Engineering Advisory Committee Meeting, in Las Vegas, NM, on February 5, 1996.

Regional Two-Year College Initiative

We have been working on a contract with the Northern New Mexico Rural Educators Network that will pilot a six-month on-line class for credit program, using the University Online System. Eight school districts are expected to participate offering a total of 100 credit courses.

The United World College is developing an educational program derived from the adaptation of geothermal energy on their campus (two faculty members and several students are involved). Exploratory drilling is to begin this spring to determine the viability of geothermal as an alternative energy source for that area of Las Vegas, NM.

We have been working with LANL property staff in trying to get equipment out to some of the postsecondary schools. The LLNL model of equipment donation is being discussed with the DOE/LAO and the DOE/ALO to see if we can use the same procedures for equipment donations.

Four students have been working as part time UGS students. One graduate student will be an offsite student, teaching courses at the School of Education at New Mexico Highlands University. He is teaching four technology education classes and providing technical assistance to the regional two-year postsecondary institutions.

Preliminary collaborations with New Mexico State University (NMSU) and 12 two-year postsecondary institutions have begun in a joint effort to develop a New Mexico advanced manufacturing technology consortium. Plans are underway for a two week summer faculty institute to be held at NMSU.

A Northern New Mexico Consortium for Advanced Technologies (NNMCAT) NSF/ATE proposal is being drafted to meet the October 1996 deadline.

Faculty and Student Teams (FAST)

In January, four potential Laboratory mentors with current university collaborations were identified to participate in the FAST program. An organizational meeting with the mentors was held on February 9 to discuss the new program and outline steps to be taken to secure four participating university teams for the summer 1996 pilot. The program is trying to address a number of institutional barriers that have traditionally contributed to keeping science research and science education apart as

somewhat isolated efforts. To overcome these barriers a new strategy was employed to identify Laboratory mentors and form university teams for this new program. The teams will consist of faculty from a science department and from the education department, as well as students.

In March, the efforts to secure the four teams for summer 1996 was accelerated. Approximately seventy Laboratory scientists were notified through UPDATE and electronic mail about the FAST program. The internal inquiries regarding the program increased dramatically and university faculty also began inquiring about the program.

Currently, for the summer of 1996, there are two teams from the University of New Mexico - Albuquerque, and fifteen other universities that are in various stages of formulating a team. Four university teams will be selected to participate this summer in the pilot session of FAST. The UNM teams will be working on two different projects; one on an earth science project to study the geochemistry of volcanic rocks, and the other team will be conducting a variety of experiments designed to study the negative hydrogen ion. We are expecting to add two additional teams as soon as they are able to plan their schedules for the summer.

EDUCATIONAL TECHNOLOGY

Teaching Hearing-Impaired Students to Speak

Advanced Display of Articulatory Movement (ADAM) has been used with hearing-impaired students at the New Mexico School for the Deaf in Santa Fe. The reception by the teachers (and apparently by the students) has been *extremely* positive. In fact, we are somewhat concerned that the teachers seem to believe that ADAM is better than we know it actually is. Sometimes we know it is not exactly right, but they are pleased nonetheless. The teacher who has been using ADAM most directly has come to the Laboratory on her own time to learn about details of ADAM and related projects. We expect other teachers to come to visit during the summer. Following are some of the comments by the teachers:

“Showing the back of the mouth is nearly impossible [using prior methods]; we often resort to hand gestures which never fully communicate what we want the students to do. This [Adam] is a tool that not only shows how the tongue ought to be placed, but also shows the students what they are currently doing. It doesn’t just tell them that they are wrong, either. It gives them a *direction* in which to make a change. This is very important.”

“We’re excited to be in at this stage in the development. Most software we find does not have our specific needs in mind. By working with the Los Alamos team, we can affect everything from what kinds of technical feedback we get to how the display looks, considering the needs of both teachers and children.”

“I see ADAM as a partially useful tool now, with some adjustment, especially regarding the size and colors of the display, but I also see it as having even greater potential. If we could get accurate feedback on consonants, not just vowels, and on movements of articulators in addition to the tongue, we could use ADAM with a much wider range of students.”

“In the past, other programs [based on abstract visual displays] have tried to dictate the level of achievement. Some kids were able to fool the machine into saying they were right with unintelligible sounds, and others would talk more clearly and the program insisted they were wrong. ADAM allows the facilitator to be the judge of whether or not the child’s speech is acceptable or improving.”

Based on these comments, as well as other recommendations and discussion with the teachers, we are making modifications to the program to suit their needs. Specifically, we are making the display simpler and brighter, following the teachers’ recommendations as to size and color. We are also making a “Passive ADAM” model, in which the user can type in any word in the dictionary. Passive ADAM will then show how to say the word.

Education Networking Support (EduNets)

*Networking Technology Planning, Consulting, and Implementation
Support for Education
Providing Training, Software Tools, and Interfaces for NM Educators to
Successfully Use Networking, Internetworking and Intranetworking
Resources
Developing and Documenting Models for Successfully Connecting
Schools to the Internet and Making Information Available for Educators
Nationally*

We actively provided networking support and training for schools in 15 school districts and 10 regional hub training and support sites this quarter.

Five new 56-KB lines and one 2-MB line were installed at schools. Three new districts and six other school sites got dial-up access active while working on getting lines ordered, and five dial-up sites moved up to 56-KB access. Several orders for 56-KB lines were placed, including two orders to upgrade site 56-KB lines to T-1 lines.

Nine new Internet labs – over 200 workstations – came online. We helped two sites install modem servers and set up "dial-in" access.

We helped get 9 new network and Internet servers online; providing server installation and setup support for a total of 26 servers at our sites this year. We provided direct LAN networking and wiring support at six sites and LAN Internet software installations at eight sites. Our local area network (LAN) and wide area network (WAN) design and technology planning support focused on ten sites; seven districts and three hubs.

We presented 24.25 days (approximately 194 hours) of formal workshops and presentations. Over 1400 hours of on-site support, 1-1 training, and consulting were provided for district and site networking support team members this quarter. Internet workshops attendance totaled 407 teachers and administrators; and special presentations attendance was estimated at 160.

Our EduNets Internet Education Working Groups (IEWG) grew dramatically this quarter; we're still entering forms and counting - we estimate over 600 people have now participated in one or more IEWG workshops or activities and over 300 are actively involved on site support teams. One new school district, Mora Independent Schools, and one new training hub, the Kirtland Technology Center, were added to the EduNets Program.

Connections!

This quarter five new 56-KB lines and one 2-MB line were installed at schools. Three new districts got dial-up access while working on getting lines ordered, more orders for 56-KB lines were placed, and two more sites placed orders to upgrade their 56-KB lines to T-1 lines. Six other

school sites got dial-up access active while working on getting lines ordered, and five dial-up sites moved up to 56-KB access. Twelve of the thirteen school districts, individual research schools, and all of the hubs now have at least one site with Internet access: 2 hubs with T-1 access, 18 sites with 56-KB connections, 1 new school with 2-MB connection, and 39 schools with dial-up Internet stations.

We helped two sites install modem servers and set up "dial-in" access: 8 lines at NNMCC and 2 lines at the Kirtland Tech Center. Schools in the districts are already being set up for dialing into the local servers. We anticipate many more schools getting dial-up access next quarter through these efforts.

More Site Internet Labs! Great Assets!

We have helped set up and provide consulting for 20 new Internet Labs at hub sites and in schools so far this year. We are now using these labs for EduNets regional workshops, school in-services, and on-site training sessions.

(* indicates new this quarter)

	Number	Approximate	
<u>FY96 Workshop Sites</u>		<u>Internet Labs</u>	<u>Number Stations</u>
UNM-Gallup, Gallup, NM	2		50
NNMCC, Española, NM	2		50
Cuba Schools Teaching Network	1	70	
Cuba High Schools Tech Lab, Cuba, NM	1	25	
Pojoaque High School, Pojoaque, NM	1	30	
Pojoaque Middle School, Pojoaque, NM		30	1
Alvord Elementary School, Santa Fe, NM	1	12	
Gallup High School, Gallup, NM	1	20	
TLC, Santa Fe, NM	1		25
* Española Elementary School, Española, NM		12	2
* Navajo Community College, Shiprock, NM	2	16	
* JADE Community Education Center, Dulce, NM		24	1
* Kirtland Technology Center, Kirtland, NM	3	90	

* Shiprock High School, Shiprock, NM
1 20

Server and LAN Installations Support – LAN and WAN Design and Planning Support

We set up seven new NT servers and two new MAC servers and provided ongoing training and support for seventeen Novell server sites this quarter. Preparations were started for new NT network management training and a continuation of Novell training next quarter for site support teams.

A special NT server was set up at NNMCC to provide e-mail accounts and a temporary web site workspace for EduNets site support teams. At least 20 site teams have started "Home Pages" under construction getting ready for their own Web servers.

Local area network (LAN) installation and setup support was provided at NNMCC, the NM State Department of Education, Shiprock High School, the Kirtland Technology Center, Española High School, Española Middle School, Bloomfield Elementary, and Peñasco Schools.

Primary LAN and WAN design and technology planning support sites this quarter:

Española, Dulce, Mora, Peñasco, St. Bonaventure, Bloomfield, and Mesa Vista schools; NNMCC, NCC-Shiprock and the JADE regional centers.

Training: Internet Workshops – Presentations - On-site 1-1 Tech Support Team

We held 19.25 days (154 hours) of formal training workshops and presentations this quarter; 24.25 days (188 hours) total so far this year. Workshops: Two two-day workshops on Novell network management; ten basic "Introduction to the Internet and Netscape" half day workshops; ten basic "Introduction to Electronic Mail" half day workshops; three "More on Communications and Netscape" half-day workshops; three "Introduction to HTML" one-day workshops; one "HTML II" one-day workshop; two special request one-day workshops designed for districts; and three special one-day "Administrators' and Superintendents' Workshops" held for principals, superintendents, and administrative staff.

Almost as soon as a site gets "connected" we start planning local workshops and we use the established sites and labs for demos and as tour sites for new participants at other schools in the region. The teachers and faculty that we teach in our trainer and support team workshops are also already using the labs to teach basic workshops for other teachers and students in their districts (we started developing feedback tools this quarter to try to gather counts and total impact information for our end-of year report).

IEWGS: District and Site Training and Technical Support Teams

We have formed LANL EduNets Internet Education Working Groups (IEWG) in all thirteen school districts, designed to include local IE training and technical support teams. Our EduNets Internet Education Working Groups (IEWG) are growing; we're still entering forms and counting - we estimate over 600 people have now participated in one or more IEWG workshops or activities and over 300 are actively involved on site support teams.

We have an active Northwestern New Mexico IE Regional Working Group with members from Gallup-McKinley County (Gallup/Crownpoint/Yatahey/Church Rock/ Ramah/Navajo/Smith Lake/Thoreau/Tohatchi), Central Consolidated (Shiprock/Newcomb/Kirtland), and Zuni districts. Most of the North Central New Mexico IE Working Groups members from the Dulce, Mesa Vista, Mora, Española, Santa Fe, and Peñasco school districts are just starting basic training, while teams at Cuba and Pojoaque – our first districts – are teaching workshops for their districts and presenting at conferences nationwide.

Working Together Pays Off!

We think that our regional support center component is really working. By helping set up training labs and getting the hubs connected, we are getting the schools connected much faster and we have been able to pool our resources better to provide networking support and offer "train-the-trainers" workshops locally. A few examples of working together and sharing resources this quarter include:

NCC-Shiprock, NCC-Tsaile, and Central Consolidated School District (CCSD) combined forces - and resources - and the result is a T-1 link to NCC-Shiprock with a 56-KB line to NCC-Tsaile and a 2 MB line to Shiprock High School. The CCSD Shiprock office and Tse-Bit-Ai Middle School are next in line for connections!

The Dulce Jade Center and the Dulce School District have pooled resources and ordered a T-1 line upgrade that will serve all of the schools, the district office, and the JADE Center. We sent out WAN consulting teams and did two days of staff training in the JADE lab this quarter and look forward to helping them get their networks and systems online next quarter!

NNMCC is providing dial-up access for Mesa Vista and some of the Española Schools IEWG teams to use while the districts work on getting lines. NNMCC and UNM-Gallup have provided lab time for us to do Internet workshops for district participants in their areas and all of the hub sites are helping test equipment and software configurations.

Scope of Program: Update

We are currently working with thirteen K-12 school districts in Northern New Mexico and have individual model and research sites in three additional districts. The projected possible K-12 impact area for the current districts, based on 1995-1996 school data: thirty-eight communities; 115 K-12 schools; 2,878 teachers; 51,546 students; in over 12,000 square miles of northern New Mexico. School districts in the program (* indicates those added this quarter):

- Cuba Independent Schools
- Pojoaque Valley Public Schools
- Central Consolidated Schools
- Gallup/McKinley County Schools
- Zuni Public Schools
- Española Municipal Schools
- Santa Fe Public Schools
- Pecos Independent Schools
- St. Bonaventure Mission Schools (Indian Mission)
- Peñasco Independent Schools
- Dulce Independent Schools
- Mesa Vista Consolidated Schools
- * Mora Independent Schools

We are also working with five community colleges and university branches, two departments of education, and two technology centers to help them develop Internet support and training centers for local schools and their communities. Hub sites currently in the program (* indicates those added this quarter):

UNM-Gallup, Gallup, NM

Northern New Mexico Community College (NNMCC), Española, NM

Crownpoint Institute of Technology (CIT), Crownpoint, NM

Navajo Community College, Shiprock, NM

Navajo Community College, Tsaile, AZ

New Mexico State Department of Education, Santa Fe, NM

Jicarilla Community Education Center, Jicarilla Apache Dept. of Education, Dulce, NM

Cooperative Educational Services, Albuquerque, NM

Technology Learning Center, Santa Fe, NM

* Kirtland Technology Center, Central Consolidated Schools, Kirtland, NM

Our Extended Team this Quarter:

We have been able to get some very good people to provide help for sites the past few months that has been very valuable to our efforts. Robert Martinez, CIC-4, working with Peñasco and Alex Montañó, CIC-5, helping with Mesa Vista have continued to provide valuable assistance for those districts. Jerry Lopez's work with the Española schools and Randy Bailey's assistance with NNMCC through Rick Ulibarri's outreach program have been great and Luis Roybal and Tim Hammock (CIC-4) provided valuable communications support at the NM State Department of Education.

Science Education and Outreach Group has partnered with CIC-6 to connect teachers and students to Internet resources and to integrate the use of technology into the classroom. The partnership combines the technical expertise of CIC-6 with the educational experience of Science Education and Outreach to prepare the schools for the use of technology to enhance instruction. The program leverages the knowledge and skills of the Regional Educational Technology Assistance (RETA) cadre who form a regional support structure that will help districts in New Mexico establish the capacity to conduct and sustain high quality educational programs and connect technological resources for additional professional development.

EduNets visits to Alvord Elementary School and the district computer lab in Santa Fe took place in November and December of 1995. EduNets workshops were planned for Gallup and Shiprock school districts in late January and early February.

Distance Learning and Educational Technology

During the reporting periods several actions were taken. First, coordination with the University-On-Line and the Northern New Mexico Rural Educators Association continued with the goal of beginning trial courses in June 1996. The greatest constraint to this activity is the cost of communications and Internet access in rural areas. Even with the National Telecommunications Act of 1996, it is doubtful that rural areas will gain affordable access in the near future. This, in part, derives from protection afforded by the act to rural, small, and cooperative phone companies.

Second, coordination with the University of New Mexico-Los Alamos was conducted regarding distance learning perspectives. There was a brief opportunity to move into the distance learning business on a large scale, but it would require an aggressive technology acquisition program. Specifically, for UNM-LA to move into the distance learning arena would have necessitated acquiring T-1 access, a file server, development of computer-based teaching facilities, and pushing the envelope of Internet communications by using voice in conjunction with courses. One approach could have been to create a subsidiary company to UNM-LA to be a local Internet provider and thereby negate or reduce University communications costs. UNM-LA management indicated a preference for video conferencing and discussions of other options subsided. Recently it has been learned that UNM-LA is a potential partner in the sharing of a T-1 line with the Los Alamos National Bank.

San Juan College, Farmington, New Mexico, requested assistance in the form of a visit to assess the efforts toward integrating computer technology into the classroom. The visit was conducted in early March and a letter report was forwarded to the president of the college. San Juan has an exemplary program in which professors are provided compensated time to explore computer technology in its many forms. This includes one on one tutoring from their director of computer applications and support for exploring various products appropriate to subject matter being taught. Subsequent to the visit and report, San Juan College personnel were informed of appropriate opportunities for NSF grants when announcements were received.

Visitors from UCLA, Department of Chemistry, demonstrated simulation tools they have developed for use in the classroom to teach molecular chemistry. Possibilities for collaboration, to include field testing in New Mexico at two-year colleges and high schools, are being pursued. A coordination visit to work out details is scheduled for early May.

Systems Modeling for Education

Dave Modl, a GRA at CIC-8, William Barber, a TSM at CIC-12, and Jeff Olson, a postdoctoral fellow in physics at MST-10, have begun developing the simulation section of the educational software product. These Laboratory technical staff have begun to interpret the design criteria created by the product development team of teachers and the education specialist. The development team decided to use the JAVA programming language from Sun Microsystems. JAVA allows developers to design interactive Web pages that are platform independent (runs on Windows 95, OS/2, UNIX, Macs, etc.) and take advantage of on-the-fly video, animation, and sound. This tool greatly simplifies the distribution dilemma inherent in schools running a variety of operating systems. Dave Modl met with the teachers in March and described his interpretation of the simulation package using the teachers' design criteria. The teachers were excited by how closely Dave's presentation mapped their individual and collective vision. A proof-of-concept version of the software is scheduled to be completed by the end of the summer. The teachers continue to develop classroom modules in data acquisition and modeling.

GEONet/TOPS Electronic Bulletin Board

The second quarter of FY96 was our first opportunity to fully test several new system functions with actual users. These functions included giving selected individuals, such as SEO program coordinators, system operator privileges so that they could update their section of GEONet. It also included a high usage test of telnet access both into and out of GEONet. The increase in the number of users of GEONet, including students, teachers and LANL staff, was astounding. We were pleased to see that the increase in LANL staff using GEONet has increased the number of public scientific discussions on the system. The second quarter also brought several new sections to the GEONet menu. Currently, we are preparing a "Summer Special" section on the bulletin board which will focus on space travel. We believe this will maintain student interest and participation in science education and telecommunications through the summer.

The focus on training during the first quarter of FY96 was a worthwhile investment. It resulted in a larger, more active user community for GEONet. The emphasis of that training was on teaching selected people how to perform on-line system maintenance, such as creating new users, checking passwords and updating files, as well as teaching them how to train others to use the bulletin board. With the help of our new "superusers," the GEONet community has reached 700 users. The community is very active, in part due to telnet access into the system, and we are receiving an average of 83 calls each day. Of those calls, 3 hours of connection time are via telnet.

We continue to develop the content of the bulletin board to better serve the user community. Through suggestions received at monthly meetings with SEO and comments from individual callers, we have added several sections to the Main Menu, including a "Tip of the Month" section.

Collated in this area are solutions and recommendations for the most common questions that we receive. It also contains a discussion of the most common mistakes our users make, such as sending a private message publicly. The response from users to this section has been positive, and the users themselves are now contributing ideas for the next "tip." Also, we have posted all registration forms and manuals publicly for users to download, complete and upload back to us. Our users find this more convenient than receiving hardcopy of the forms and mailing them to us.

Model-Nets: A National Study of Viable Models of Networking Technology in K-12 Education

During the second quarter of FY96, the Model-Nets final report was completed, and a networking guide to assist schools and districts in network planning was begun. Work began on the production of an interactive multimedia CD-ROM guide for school districts to disseminate the findings of the Model Nets study, and to help schools with network planning. A computer scientist in CIC-6 will assist in CD-ROM production and will create and update WWW pages for the program as required. Software and hardware is currently being acquired for CD-ROM production, and CD-ROM and CE-ROM and WWW design. Meetings are held on a regular basis to maintain product and report coordination.

Hypermedia Compact Disc/Fast Tool Servomechanism (FTS)

Introduction

The production of Inertial Confinement Fusion (ICF) targets for the National Ignition Facility is an important goal being pursued at Los Alamos National Laboratory (LANL). The geometry of these targets must be very well controlled because surface perturbations can create hydrodynamic instabilities when the targets are imploded during the fusion process. To understand the impact of these perturbations and to estimate the surface finish requirements, targets with known surface perturbations are being built. Experimental data for surface perturbations with a known amplitude and shape can then be compared with theoretical data generated by computer models. To assist LANL in this effort, the Precision Engineering Center (PEC) of North Carolina State University, is designing a fast tool servo (FTS) system to be integrated into a diamond turning machine at Los Alamos. This system will allow the fabrication of non-rotationally symmetric features on the target surface and will improve the speed and capability of the target fabrication facility. The FTS will be added to a Moore M-18 Aspheric Generator and will utilize an Aerotech Unidex 31 controller. A second phase of this project will involve the development of a Hypermedia Compact Disc (HCD) which will document the use of the FTS. The HCD will use multimedia tools such as animation, graphics, still photos, video and text to describe the setup, operation, design and maintenance of the fast tool servo.

Target Specifications

The manufacturing of ICF targets requires high machining accuracy and precision. Current LANL work involves machining surface features around the circumference of 430 mm diameter cylindrical targets using a precision fly-cutter mounted on a diamond turning machine. These surface features resemble a sine wave pattern with an amplitude of 0.5 mm and a frequency of 10 waves per target revolution. The use of a fly-cutter is time consuming as it requires multiple cuts and an elaborate part mounting setup. A true sine wave surface geometry could be produced with a single machining pass using a FTS. It is expected that additional ICF tests will require the production of similar sized targets with up to 50 sine waves per revolution. LANL also has plans to produce spherical targets which will involve machining two hemispheres with diameters less than 500 mm. The production of these hemispheres will require the machining of combinations of spherical harmonics on the outer surface with amplitudes similar to those of the sine wave targets. Spherical targets can not be produced using LANL's current diamond turning equipment, but should be machinable using a FTS mounted on a rotary table. The desired figure accuracy of both the cylindrical and spherical target's surface perturbations is 10 nm peak to valley. The desired surface finish along the length of the cylindrical targets is also on the order of 10 nm peak to valley.

FTS Structure

Design specifications for the FTS have been developed based on the target specifications and the hardware to be utilized. A cross section of the FTS is shown in Figure 1. Tool motion is produced by applying voltage to a piezoelectric actuator, while position control is maintained using feedback from a capacitance gage. The support flexures provide a preload to the piezoelectric actuator and insure that tool motion occurs perpendicular to the cutting surface. Only 1 mm of tool motion is required to machine all current ICF targets. Thus, a total range of motion of 10 mm has been selected for the FTS. The machining of ICF targets will require tool motions at a frequency much higher than that which is attainable with conventional diamond turning machine slideways. Thus, a design goal for the FTS is for the physical system to have a natural frequency on the order of 10 kHz. To achieve high-resolution in the sine wave features produced, the spindle speed will be limited to 200 rpm. This speed will allow the controller, which can maintain an update rate of 15 kHz, to generate 90 data points per sine wave for the maximum of 50 sine waves per part revolution.

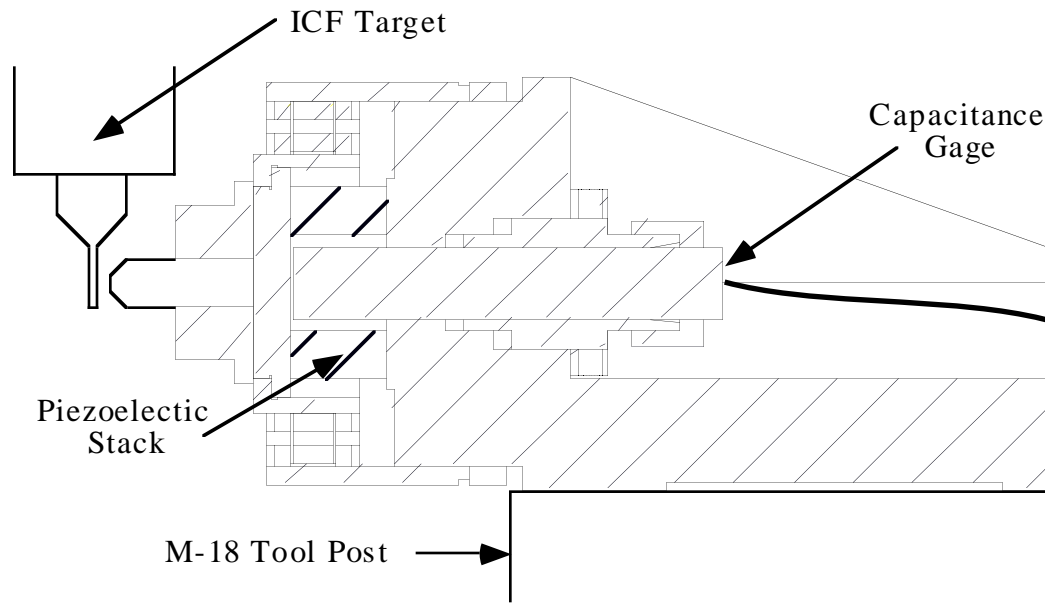


Figure 1: Fast tool servo cross-section.

The fast tool servo will be designed to mount on a Moore M-18 Aspheric Generator diamond turning machine. The M-18 has cross axis slides and a rotary table. The FTS structure will be attached to the tool post such that the tool tip can be located at the center of the rotary table in the horizontal plane and level with the spindle axis in the vertical plane. The FTS will also be designed such that it can be mounted on a Rank Pneumo Nanoform 600. The Nanoform is located at the PEC and will serve as the initial test bed for the FTS. This DTM is a T-based design without a rotary table.

Capacitance Gage Position Feedback

The production of ICF targets requires figure accuracies of less than 10 nm. Thus, it is desired that the position feedback system be able to measure tool position to within 1 nm. The capacitance gage which will be used with the FTS is a Lion Precision PX405HC probe with a DMT10 remote driver module. Tests were performed at the PEC using a probe calibrated to operate with a measurable range of 20 μm and a noise level of 1 nm. The tests showed that the probe did have a rms noise level of approximately 1 nm. These tests were performed as the probe measured the stationary surface of a fast tool servo currently used at the PEC. The FTS and the probe were set up on the Nanoform 600 to simulate the actual operating conditions for the FTS. A Lion Precision capacitance gage system with similar

calibration has been ordered, and its delivery is expected by the end of April.



Figure 2: Fast tool servomechanism.

FTS Status

The physical design of the fast tool servo has been completed, and the mechanical components of the system have all been manufactured. Figure 2 shows the FTS upon assembly. A piezoelectric actuator made by EDO Corporation has been ordered and received. The actuator consists of 24 discs made of EC-76 PZT piezoelectric material which are 0.508 mm thick. The actuator has a 25.4 mm OD, a 12.7 mm ID and a length of 13.7 mm. It has a maximum expansion of approximately 11 μm at an applied voltage of 800 V.

Controller Status

Both the M-18 and the Nanoform 600 will use an Aerotech Unidex 31 controller. Software modifications will be made such that the U31 will control the FTS position based on the capacitance gage feedback data. Hardware modifications will also be made to include an auxiliary DSP board in the U31 VME-bus to interface with the FTS. Any software or hardware modifications to the controller operating the Nanoform 600 should be transferable to the M-18 at LANL.

A Pentek 4284 VME-bus DSP board has been purchased and interfaced to the hardware of the Aerotech U31 controller on the Nanoform 600 DTM. A Pentek 4242 Analog I/O board will provide the interfaces necessary for the feedback control of the FTS. Modifications to the U31 controller software are needed to coordinate the control of the axes and spindle of the Nanoform 600 with that of the FTS. These changes will be made by Aerotech to facilitate the transfer of the system to the M-18 at LANL.

Work is also underway to develop a control algorithm to be utilized by the FTS. Two different control schemes are under consideration, a proportional-integral-derivative controller and a pole-placement observer controller. Work will be performed to implement both types of algorithms. Tests will then be performed using the FTS system to determine which algorithm provides the optimal system response.

Hypermedia Compact Disc Documentation

The addition of the fast tool servo to the M-18 will produce a one-of-a-kind machine tool which will not be operated by a large number of people. One of the problems associated with similar types of equipment is a lack of adequate documentation. Recent growth in the development of multimedia technology has provided computer users the opportunity to use text, graphics, animation, sound and video in detailing almost any subject. The combination of these different forms of communication provide a powerful tool for the documentation of technology such as the fast tool servo. The hypermedia compact disc which is to be developed will contain information describing the setup, operation, design, safety, maintenance, and fault identification of the FTS. The production of the HCD will initially be done on a Macintosh using the software package SuperCard. Since the Aerotech Unidex 31 software operates on a PC using OS/2, the Macintosh version will be converted to a PC format so that it may be read by the controller. Originally, the Windows compiler was to be available before the completion of this project. The release of the compiler, however, has been postponed until the end of this year. Thus, the HCD documentation will be completed in a Macintosh form, and will be converted to a PC format once the compiler is available.

Although the FTS system has not been completed, work has already begun on the creation of the HCD documentation. Considerable work has been performed on the HCD's organization and structure. An outline detailing the subjects found in the documentation has been created, and the SuperCard scripts necessary for the documentation to properly function have been generated. The visual organization and layout of the pages of the HCD have also been completed. Thus, all of the components

required for the documentation to operate correctly are in place. Work must now be done to generate the text, graphics, pictures and movies which will be used to provide information to the user of the HCD.

PUBLIC UNDERSTANDING OF SCIENCE

Practical Applications for Young Scientists (PAYS)

Activity on the PAYS program in this quarter focused on three main areas: Academic year program implementation, summer program design, and PAYS II recruitment.

The academic year PAYS program began on February 7 and will run through April 24. Nineteen high school juniors and seniors from high schools throughout northern New Mexico (Mesa Vista, Peñasco, Española, Pojoaque, and Los Alamos) attended the first session. Topics covered during this quarter include:

- Mechanics of Writing/Journalism (Steve Sandoval, LANL Public Affairs, and Steve Shankland, Los Alamos Monitor);
- Technical Writing (Pat Wing, CIC-1);
- Risk Communication (Susan Klein and Todd Heinrichs, CIC-1);
- Graphic Design (Ruth Holt, CIC-1);
- Museum Exhibits (Judy Machen, Bradbury Science Museum);
- Interpreting Science Through Live Demonstrations (Garry Franklin, Bradbury Science Museum);
- Video Journalism (Kathy DeLucas, LANL Public Affairs).

Planning efforts for the summer PAYS program (July 15–August 2nd) focused on researching Laboratory-related science themes for student communications projects and identifying Laboratory technical resources to assist students in carrying out these projects. Tentative projects for the summer PAYS program include:

- Update/Redesign the Bradbury Science Museum's WWW Page to be displayed on the Internet as a part of the Laboratory's WWW Pages;
- Develop a Hyperstudio program on "ELSI: The Ethical, Legal, and Social Implications of the Human Genome Project," to be displayed at the Bradbury Science Museum as a part of the current Human Genome Project exhibit;
- Design and Develop this year's PAYS Journal, a newsletter which highlights the work of PAYS students and their summer projects;

- Produce a brochure on the DOE's "NIS-TEP" Teacher Enhancement Program;
- Design and Deliver a hands-on presentation on radiation for the Bradbury Science Museum;
- Update the ALEXIS (Satellite Operations Center) museum display at the Bradbury Science Museum.

PAYS II recruiting began with an informational mailing (program overview and applications) to all summer 1995 PAYS I students. Applications are due April 24, 1996.

Science Education Information On-line

The World Wide Web (WWW) server for the Science and Math Education Program went through a major update this quarter. The program information for Science Education was updated to reflect the program changes for FY96.

Several other improvements to the system software and hardware were also made in preparation for the move of the server to a new hardware platform. The new system is a Macintosh 9500/120 running Mac OS system 7.5.3.

Work is still continuing in several areas. These include:

- Continue to refine the program information to reflect FY96 changes.
- Assistance to projects to add their resources to the server.
- Continuing work for the upgrade to the server hardware and software.

From January 1 through March 31 over 4,854 different sites from 46 countries visited the server. These visitors transferred 50,492 files representing more than 397 million bytes of data. Detailed statistics on access to the server are kept and summaries are available for viewing on the server. The top eight countries were:

Canada	1190
United States of America	992
United Kingdom	398
Japan	263
Germany	259
Australia	235
Sweden	175
Italy	147

The top seven subject areas of interest on the server for this quarter were:

- Science at Home
- Science Education Program Project Information
- Science and Technology Base University Outreach Team
- NM On-line Internet Institute (OII)
- TEAM Project Information
- Science and Technology Base UC Coordination Team
- Model-Nets Project Information

The uniform resource locator (URL) for the WWW server is:

<http://education.lanl.gov>.

OTHER

K-12 Equipment for Education Program

During the second quarter of FY96, 35 items were gifted through the K-12 Equipment for Education Program to 19 schools participating in the Critical Issues Forum, Systems Modeling for Education, and the Supercomputing Challenge. The equipment had a total value of \$84,254.14.